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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/527,790	01/06/2006	Aiichirou Sasaki	44471/313606	7591

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EXAMINER
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SLOMSKI, REBECCA

ART UNIT	PAPER NUMBER
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2877

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/527,790	<b>Applicant(s)</b> SASAKI ET AL.	
	<b>Examiner</b> REBECCA C. SLOMSKI	<b>Art Unit</b> 2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 31 August 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-7 and 12 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5, 7 and 12 is/are rejected.
- 7) ☒ Claim(s) 6 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 March 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

DETAILED ACTION

***Claim Rejections - 35 USC § 103***

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1, 4, 5, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mitsuru et al. JP Publication 2003-098205 in view of Buks U.S. Patent #6,496,013.

1. With respect to claim 1, Mitsuru et al. discloses a field detecting optical device comprising:
  - A light source (Drawing 1, laser diode 21)
  - An electro optic crystal which is applied with an electric field based on a signal under test in which a birefringent index changes according to the electric field and which changes a polarization state of light incident from said light source according to the birefringent index and emits the light (Drawing 1, electro optic element 23, P.0014)
  - A detector that detects an electrical signal according to the change of the polarization state of the light emitted from said electro optic crystal (Drawing 1, photodiodes 43a and 43b)
  - A first electrode that is provided close to said electro optic crystal and that applies the electric field based on the signal under test to said electro optic crystal (Drawing 1, 1<sup>st</sup> electrode 27)
  - A second electrode that is provided close to said electro optic crystal and thereby forming a pair with said first electrode (Drawing 1, 2<sup>nd</sup> electrode 25)
  - An auxiliary electrode that is electrically connected to said second electrode and that forms a ground capacitor (Drawing 1, ground electrode 31)

However, Mitsuru fails to specifically disclose the capacitance between said auxiliary electrode and a ground is larger than a capacitance between said first electrode and second electrode.

Buks discloses a device for testing circuit boards comprising:

- A capacitance between an auxiliary electrode and a ground is larger than a capacitance between said first electrode and second electrode (Col.1, l 43-54)

It would have been obvious to one of ordinary skill in the art at the time of the invention to make the capacitance to the ground much larger than the measuring capacitance since a smaller change in the electric field would comparatively change the measuring capacitance to a greater degree, increasing the sensitivity.

2. With respect to claim 4, Mitsuru discloses all of the limitations as applied to claim 1 above. In addition, Mitsuru discloses:

- Wherein a distance between said auxiliary electrode and second electrode is larger than a distance between said first electrode and second electrode (Drawing 1, distance between electrode 25 and electrode 31 is larger than distance between electrode 25 and electrode 27)

3. With respect to claim 5, Mitsuru et al. discloses a field detecting optical device comprising all of the limitations as applied to claim 1 above.

However, Mitsuru et al. fails to disclose a distance changing means for changing a distance between said auxiliary electrode and second electrode by moving said auxiliary electrode.

It would have been obvious to one of ordinary skill in the art at the time the invention was conceived to change the distance between the auxiliary electrode and second electrode by moving said auxiliary

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electrode since it has been held that making an old device movable without producing any new and unexpected results involves only routine skill in the art. In re Lindberg, 93 USPQ 23 (CCPA 1952). It would have been desirable to have a distance changing means for moving the auxiliary electrode since being able to place the electrode at varied distances allows for the electric field sensor as a whole to change in size depending on the space available and to keep the electrodes a distance away from each other dependent upon the voltages being used to avoid electric field cross talk.

4. With respect to claim 7, Mitsuru et al. discloses a field detecting optical device comprising all of the limitations as applied to claim 1 above.

However, Mitsuru et al. fails to specifically disclose said auxiliary electrode is insulated from a circuit that constitutes said detector and a circuit that drives said light source.

It would have been obvious to one of ordinary skill in the art at the time the invention was conceived to insulate the auxiliary electrode from the circuits since this is well known in the art and necessary in order to protect the circuit elements from the ground voltage charges of the electrode.

Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mitsuru et al. JP Publication 2003-098205 in view of Buks et al. U.S. Patent #6,496,013 and further in view of Brown U.S. Patent #5,789,846.

5. With respect to claims 2 and 3, Mitsuru et al. discloses a field detecting optical device comprising all of the limitations as applied to claim 1 above. However, Mitsuru et al. fails to specifically disclose the surface area of the auxiliary electrode is larger than the surface area of the first electrode and the second electrode, as well as the auxiliary electrode is in the shape of a bar, tubular or spherical.

Brown discloses a capacitively coupled ground electrode comprising:

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- A first and second electrode (Figure 1, signal electrode and secondary ground electrode S and G')
- An auxiliary electrode that is electrically connected to said second electrode and forms a ground capacitor (Figure 1, primary ground electrode G)
- A surface area of said auxiliary electrode is larger than each surface area of said first electrode and second electrode (Figure 1, primary ground G is larger than S and G')
- A shape of said auxiliary electrode is a bar shape (Figure 1, primary ground G)

It would have been obvious to one of ordinary skill in the art at the time the invention was conceived to include an auxiliary electrode (ground electrode) that is larger than a first and second electrode (signal electrode) since increasing the surface area of the ground electrode in relation to the surface area of the signal electrode increases the capacitance, reducing the impedance, making the connections more cost effective by reducing loss.

Additionally, it would have been obvious to have a capacitance formed between the ground electrode and the ground rather than grounding by direct contact since it is well known in the art that there is less error from a direct current path being created as evidenced by "Lessons in Electrical Circuits" Page 24.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito et al. U.S. Patent #6,624,644 in view of Law et al. U.S. Publication 2004/0227942.

6. With respect to claim 12, Ito et al. discloses an electro-optic probe and magneto-optic probe comprising:

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- An electro optic crystal which is applied with an electric field based on a signal under test in which a birefringent index changes according to the electric field and which changes a polarization state of the incident light according to the birefringent index and emits the light (Figure 1, electro optic element 2, Col. 4, L 40-47)
- A polarizing beam splitter that transmits a P polarized light component of the light having the changed polarization state which is emitted from said electro optic crystal and that reflects the an S polarized light component of the light thereby splitting said light having the changed polarization state into the P polarized light component and the S polarized light component (Figure 1, polarized beam splitter 5)
- A quarter wave plate that converts a P polarized light and an S polarized light into a circularly polarized light respectively (Figure 1, quarter wave plate 4)
- A first photo detector that converts the P polarized light component which is converted into the circularly polarized light by said quarter wave plate into an electrical signal (Figure 1, photodiode 13, Col.4, L 44-47)
- A second photo detector that converts the S polarized light component which is converted into the circularly polarized light by said quarter wave plate into an electrical signal (Figure 1, photodiode 12, Col.4, L 44-47)

However, Ito et al. fails to disclose two quarter wave plates that convert the separated S and P polarized light components into circularly polarized light after being split by the polarized beam splitter.

Law et al. discloses an active control of orthogonal polarizations comprising:

- An electro optic crystal which is applied with an electric field based on a signal under test in which a birefringent index changes according to the electric field and which changes a polarization state of the incident light according to the birefringent index and emits the light (Figure 6D, PSM 14D, as described by 14A in P.0034)
- A beam splitter splitting said light having the changed polarization state into the P polarized light component and the S polarized light component (Figure 6D, beam splitter 24)
- A first quarter wave plate that converts a P polarized light component into a circularly polarized light (Figure 6D, quarter wave plate 600)
- A second quarter wave plate that converts a S polarized light component into a circularly polarized light (Figure 6D, quarter wave plate 602)
- A photo detector that converts the P and S polarized light components which is converted into the circularly polarized light by said quarter wave plate into an electrical signal (Figure 6D, light detector 40)

It would have been obvious to one of ordinary skill in the art at the time the invention was conceived to convert the polarized light components into circularly polarized light in two separate beams since this would allow the beams to be more controllable, by knowing they are circularly polarized rather than the polarization changing in an uncalculated way by the beam splitter. Additionally, the two separate quarter wave plates would give the apparatus increased applications in allowing the two measurements to be carried out separately for two potentially different outcomes. (Law et al, one for amplitude measurement and one for interferometry, Figure 6D, P.0005)



Additionally, Ito in view of Law doesn't specifically disclose a part of the light reflected from the light receiving surface back through the quarter wave plates and back to the beam splitter before being prevented from returning to the electro optic crystal. However, the combination of Ito in view of Law is the same as in the application, such that any light returning from the detector face would be polarized and reflected or transmitted in the same way as the claim limitation, at least partially preventing a return towards the electro optic crystal or variable retarders in the case of Law.

### ***Allowable Subject Matter***

Claim 6 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

### ***Response to Arguments***

7. With regards to claims 1 - 4 anticipated by Mitsuru, the applicant argues that the Mitsuru fails to disclose the capacitance between said auxiliary electrode and a ground is larger than a capacitance between said first electrode and second electrode. The arguments are persuasive in view of the claim amendment. However, a new rejection is made under 35 USC 103(a) over Mitsuru in view of Buks as disclosed above.
8. With regards to claim 12 unpatentable over Ito in view of Law, the applicant argues that Law fails to disclose a returning-light prevention feature. The examiner agrees that the set up of Law differs from the current application in that the beam splitter is not necessarily a polarization beam splitter. However, the beam splitter still functions to separate some of the light, such that at least a portion of the reflected light component is diverted by the multiple beam splitters such that a very small portion

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would be capable of returning through the system. Additionally, the rejection was made over the combination of Ito in view of Law. Ito relies on polarized beam splitters. Should the combination be made with the apparatus of Ito including the quarter wave plates of Law placed as disclosed, the invention would function the same as the current application and any return light would be diverted. For this reason, the rejection is maintained.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to REBECCA C. SLOMSKI whose telephone number is (571)272-9787. The examiner can normally be reached on Monday through Thursday, 7:30 am - 5:00 pm EST.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr. can be reached on 571-272-2059. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Gregory J. Toatley, Jr./  
Supervisory Patent Examiner,  
Art Unit 2877  
7 December 2009

Rebecca C Slomski  
Patent Examiner

rCS